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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Andrew John Cardno	
Appln. No.:	09/674,469	
Filed:	February 26, 2001	Examiner: J. Ouellette
Title:	Data Visualisation System and Method	Group Art Unit: 3629

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Francis Erach  
(Signature)

Dear Sir:

Pursuant to 35 U.S.C. §119, to perfect the claim for foreign priority benefits in the above-identified patent application, enclosed for filing are certified copies of the following New Zealand Applications including their specifications and drawings:

- 1) New Zealand Application No. 336257, filed on June 14, 1999,
- 2) New Zealand Application No. 503480, filed on March 20, 2000,
- 3) New Zealand Application No. 504315, filed on May 3, 2000, and
- 4) New Zealand Application No. 504589, filed on May 17, 2000.

Respectfully submitted,

DORSEY & WHITNEY LLP  
Customer Number 25763

Date: October 28, 2003

By: David E. Bruhn  
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## CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 14 June 1999 with an application for Letters Patent number 336257 made by COMPUDIGM INTERNATIONAL LIMITED.

Dated 10 October 2003.



Neville Harris  
Commissioner of Patents, Trade Marks and Designs



336257

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Patents Form No. 4

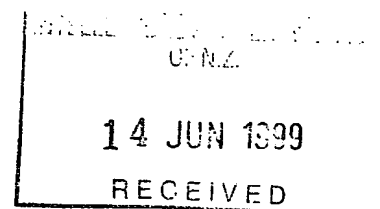
15

PATENTS ACT 1953

**PROVISIONAL SPECIFICATION**

20 **DATA VISUALISATION SYSTEM AND METHOD**

We, **COMPUDIGM INTERNATIONAL LIMITED**, a New Zealand company, of Level 12, BOC House, 133-137 The Terrace, Wellington, New Zealand, do hereby declare this invention to be described in the following statement:



## DATA VISUALISATION SYSTEM AND METHOD

### FIELD OF INVENTION

- 5 The invention relates to a data visualisation system and method.

### BACKGROUND TO INVENTION

10 Merchants today generate and collect large volumes of data during the course of their business. To compete effectively it is necessary for a merchant to be able to identify and use information hidden in the collected data. The task of identifying this hidden information has proved very difficult for merchants.

15 Traditionally the identification of this information has been achieved by running a query on a set of data stored in a database for example. The merchant first creates a hypothesis, converts this hypothesis to a query, runs the query on the database, and interprets the results obtained with respect to the original hypothesis.

20 Where a merchant is a financial institution the merchant may, for example, hypothesise that high net worth customers generally hold life insurance policies. After converting the hypothesis to an appropriate query and running the query on the merchant's customer database, the merchant can interpret the results and verify whether the selected customers comprise likely candidates for the merchant's own life insurance policy product.

25 One disadvantage of this verification driven hypothesis approach is that the merchant must form the desired hypotheses in advance. This is merely confirming what the merchant already suspects and does not provide the merchant with information which may be unexpected. Another disadvantage is that the merchant needs to have  
30 available the technical knowledge to formulate the appropriate queries.

## SUMMARY OF INVENTION

In broad terms the invention comprises a data visualisation system comprising a memory in which is maintained an interaction database of interaction data representing interactions between customers and merchants; display means arranged to display a graphical representation of at least one merchant; retrieval means arranged to retrieve from the interaction database data representing interactions between customers and merchants; and report generating means arranged to superimpose a representation of the data retrieved from the interaction database on the representation of the merchant.

Preferably one or more of the merchants operates from one or more commercial premises or stores, and the display means is arranged to display a graphical spatial representation of the premises of the merchant(s).

Preferably the representation of the data superimposed on the representation of the merchant is based on at least one key performance indicator.

Preferably the interaction data includes date and/or time data.

Preferably one or more of the interactions has a monetary value, and the interaction data obtained from the interactions includes the monetary value.

Preferably one or more of the interactions relates to the sale of goods and/or services, and the interaction data obtained from the interactions includes a goods/services identifier.

In broad terms the invention in another form comprises a data visualisation method comprising the steps of maintaining in a memory an interaction database of interaction data representing interactions between customers and merchants; displaying a graphical representation of at least one merchant; retrieving from the interaction database data representing interactions between customers and merchants; and superimposing a representation of the data retrieved from the interaction database on the representation of the merchant.

## BRIEF DESCRIPTION OF THE FIGURES

Preferred forms of the data visualisation system and method will now be described with reference to the accompanying figures in which:

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Figure 1 shows a block diagram of the system of the invention;

Figure 2 shows an interaction between a merchant and a customer and the migration, retrieval and display of data obtained from the interaction;

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Figures 3 to 14 show an example of a typical data representation at time intervals, ranging from 10:00 to 21:00; and

Figures 15 to 23 illustrate the options presented to the user when using the system.

15

## DETAILED DESCRIPTION OF PREFERRED FORMS

Referring to Figure 1, the preferred system 2 comprises a data processor 4 interfaced to a memory 6, the processor 4 and the memory 6 operating under the control of appropriate operating and application software. Stored in the memory 6 is a data repository, for example, a data warehouse 8. It is envisaged that the data repository may alternatively comprise a single database, a collection of databases, or a data mart.

20

The preferred data warehouse 8 includes interaction data 10 representing interactions between customers and merchants as will be more particularly described below. The data warehouse may also include data from other sources, for example, census data 12, scan data 14 obtained from scanning barcodes on products, data from a merchant customer database 16, data from a merchant loyalty programme 18, and/or promotion data 20 held by a merchant.

30

The processor 4 is connected to an input device 22, for example, a keyboard and mouse, and a display device 24, for example, a monitor. The processor 4 may also be connected to a suitable input/output device such as a disk drive 26 and may also be connected to a printer 30.

35

Data obtained through the input device 22, from memory 6 and from disk drive 26, is displayed to the user on display device 24 or output to printer 30. The processor 4, memory 6, input device 22, display device 24, disk drive 26 and/or printer 30 may be set up as a stand-alone computer or may be connected to further components in a network. Networks may be of any type, for example, Internet, Intranet, local area and wide area networks.

As shown in Figure 2, a customer 32 interacts with a merchant 34. Typically, merchant 34 operates in a commercial premises or store from which customer 32 purchases goods or services. The merchant may, for example, operate a petrol station in one or more geographic locations. The merchant 34 may alternatively operate a casino or other gaming facility in which a number of gaming machines and stations are positioned in one or more rooms at a common venue. The merchant may also operate a warehouse facility or may offer a range of financial services.

The merchant does not necessarily need to operate from a commercial premises or store. For example, the merchant may operate from strategically placed machines, for example, vending machines, parking meters, laundry machines, transportation ticketing machines and/or amusement machines. The merchant 34 may also operate a mail order catalogue service, direct market goods or services, or network market through a hierarchy of distributors and resellers. As is becoming increasingly common, merchant 34 may alternatively operate from a website or other electronic medium. It will be appreciated that the nature of business of merchant 34 includes a wide range of activities.

Customer 32 may be a purchaser of goods or services from merchant 34. An interaction between customer 32 and the merchant 34 may be initiated by either the customer 32 or by the merchant 34. As customer 32 interacts with merchant 34 the interaction generates interaction data 10 which is collected as indicated at 36.

A typical record of collected interaction data is shown at 38. The record may include, for example, a merchant identifier. This merchant identifier could be used to identify a particular merchant, and where a merchant operates from more than one geographic location, the merchant identifier, or some other identifier included in record 38, may identify the geographic location in which the interaction occurs.

The record 38 could also include a customer identifier. The merchant may for example issue an incentive-supported customer loyalty card which is then used by the customer during interactions with the merchant. The loyalty card preferably has stored on it a customer identifier and may have stored other data, for example residential address and family size of the customer.

Where the merchant operates retail premises, the merchant may have installed apparatus for reading the bar codes of products sold. Alternatively each product may be identified by a code assigned by the merchant which is recorded at the time of sale. In this way, the record 38 may also include a suitable goods or services identifier, for example, a product or service code, to identify which goods or services were involved in the interaction.

The record 38 may also include data such as the date and/or time at which the interaction between the customer and the merchant took place and/or the cash value of the transaction.

The interaction data 10 is migrated to the data warehouse as indicated at 40. Migration may be performed, for example, by way of daily updates. It is advantageous to cleanse, catalogue and validate the interaction data 10 during migration of the data to the data warehouse, and this could be performed by either the merchant or by a third party. Once in the data warehouse, the data could be linked to other sources of data for subsequent retrieval, for example census data, scan data, data from a merchant customer database, data from a merchant loyalty programme, and promotion data held by the merchant.

The data warehouse 8 could be maintained by a merchant or alternatively could be maintained by a third party. Updates to the data warehouse could be carried out by the merchant directly, or alternatively the merchant could provide batched data to a third party for updating the data. Alternatively, a third party could be entrusted with the task of collecting the interaction data 10 and migrating the data to the data warehouse 8.

The system retrieves data representing interactions between customers and merchants from the data warehouse as indicated at 42. Preferably the system permits the user to



specify the data to be retrieved, as will be described below with reference to Figures 15 to 23.

After data retrieval, the system displays the data as indicated at 44, preferably as a graphic representation of the data on display device 24. The preferred system may allow the user to select the way in which the data is presented, as will be described with reference to Figures 15 to 23. The display of this data will be more particularly described with reference to Figures 3 to 14, in which sales activity for a retail merchant during a specified period are displayed.

Referring to Figure 3, a graphical representation of a merchant is generated and is displayed on display device 24. Where a merchant operates from a retail store, the graphical representation could include a graphical spatial representation of the store, as shown in Figure 3. The representation shows the position of the door 50, service counter and cash register 52 and a number of shelves 54 on which products are displayed.

Where the merchant operates from a number of retail stores, the graphical representation could include spatial representations of each store and could also include a large scale map of the geographical area in which the merchant's stores are located.

Where a merchant operates a casino or similar gaming venue, the graphical representation could include a spatial representation of each individual room in the casino showing the layout of individual gaming machines and stations. The representation could also include a large scale representation of the entire premises showing smaller representations of individual rooms.

It will be appreciated that where a merchant operates a warehouse, the representations could show the layout of various goods stored by the merchant. Where the merchant provides services, for example financial services, the representations could include schematic representations of the different areas of services offered by the merchant.

The system is arranged to superimpose a representation of the data retrieved from the data warehouse 8 on the representation of the premises of the merchant. As shown in

Figure 3, the system has displayed a representation of sales occurring on 2 April 1998 during a predetermined period commencing at 10:00. Net revenue is indicated at 56 as being \$0.00 and turnover is indicated at 58 as also being at \$0.00.

- 5 Figure 4 illustrates the same store 1 hour later at 11:00. Net revenue and turnover have increased due to sales of goods and services made during the preceding hour. Sales of products have changed as shown in the contours.

10 The system may present to the user a number of key performance indicators (KPI's) in addition to or as an alternative to revenue and turnover. These KPI's may include, for example, sales, gross profit, net profit, gross margin return on inventory investment (GMROI), net margin return on inventory investment (NMROI), return on net asset (RONA), and/or loyalty sales data.

- 15 The system may be arranged to show contours representing sales of particular goods and services by displaying contour lines around the locations in the spatial representation of the merchant store in which those goods or services are located. For example as shown in Figure 4, contour lines 60 indicate the products having the most sales in the preceding hour.

20 The system may also overlay text over the spatial representation. For example, different shelves in the store or different products on the shelves may be identified by labels. Other labels could include the product selling price, product sales during the preceding hour, or other information meaningful to the user.

25 Figures 5 to 14 represent the same store at time intervals of 12:00, 13:00, 14:00, 15:00, 16:00, 17:00, 18:00, 19:00, 20:00 and 21:00 respectively. The representations show the rate at which net revenue and turnover increase over the time period, and show customer buying patterns over the same period.

30 A merchant operating a service station, for example, may identify from the above representations the periods in which sales of pies and other hot food are the highest. By keeping warmers and shelves stocked in advance of these peak periods, the merchant can meet the demand of customers and reduce wastage.

35

The same merchant may also see from the representations that sales of newspapers follow a similar pattern to sales of stamps. This may indicate to the merchant that sales of newspapers are correlated to sales of stamps. By positioning newspapers and stamps in close proximity to each other within the store, the merchant could increase sales of both products.

A merchant could initiate a promotional campaign in relation to a particular product and then identify the effectiveness of the campaign by viewing the representations generated by the system.

It will be appreciated that the uses and potential areas of application of the system are wide and varied. The merchant does not need to follow the traditional approach of forming a hypothesis in advance and then verifying the hypothesis, although the representations generated by the system may be useful for verifying a particular hypothesis. The system may also be useful in identifying unexpected trends in the data.

The representations shown in Figures 3 to 14 may be displayed on display device 24 as a series of bitmap snapshot images with the option of printing these images on printer 30. Alternatively, the representations may be displayed in an animated form with a representation of the interactions between a customer and a merchant being superimposed on the spatial representation as a function of time.

Having shown a typical representation of the data with reference to Figures 3 to 14, the operation of the system will now be described with reference to Figures 15 to 23. The preferred system displays to the user several options for the retrieval and display of data. The system may include, for example, a visualisation wizard 70 implemented in a MICROSOFT WINDOWS environment. It is envisaged that known equivalents may replace the wizard 70 when the system is implemented in different environments such as APPLE or SUN MICROSYSTEMS.

As shown in Figure 15, the visualisation wizard 70 may include Cancel and Finish buttons, as well as Back and Next navigation buttons to move between options presented to the user. The first screen of the wizard may describe the options available to the user. For example, a visualisation may be either a still snapshot or an animation, and the visualisations may be shaded and/or contoured. Where the

visualisation is shaded, the shading may be carried out by a key performance indicator, a category of goods or services or a correlation between, for example, goods or services or key performance indicators. Contouring may be ranked by key performance indicator or by a correlation.

5

Figure 16 shows the next screen presented to the user in which the user is prompted to select the country, city or store of a merchant for visualisation.

Referring to Figure 17, the user is next asked to specify the type of visualisation. This could be either a bitmap, metafile or animation file.

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As shown in Figure 18, the user is then prompted to specify on which basis the contouring will be performed. The user may select either no contouring, or may select one key performance indicator, for example, sales, gross profit, net profit, gross margin return on inventory investment (GMROI), or net margin return on inventory (NMROI). Another option available to the user could be the return on net investment (RONI).

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Alternatively, the user may select some form of correlation on which to contour the data, for example loyalty sales. Contouring on loyalty sales, for example, would show the user the number of sales or proportion of sales of a particular range of goods or services purchased using a loyalty card.

20

Figure 19 illustrates the shading options available to the user. The user may select no shading, or may select shading by manufacturer, by sale, gross profit, net profit, or other key performance indicators.

25

The user may also select the option of restricting a shelf or bay by value on the basis of stock turnover or by manufacturer. For example, a merchant may be interested only in sales of goods produced by a particular manufacturer, or a gaming facility may be interested only in use of machines by a particular manufacturer. The restriction option allows a user to highlight data of interest to it.

30

Referring to Figure 20, the user is prompted for the time period for the visualisation. The preferred system allows the user to specify a range of dates and/or a range of times within those dates. The user may also select the appropriate image size for the visualisation, depending on whether it will be displayed on a screen or on a printer.

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As shown in Figure 21, the preferred system permits the user to select labels to identify the representation of the merchant. The user may either elect to have no labels, or may instead elect to have a shelf label, product label, product selling price or product sales.

Referring to Figure 22, the user may also be presented with the option of selecting regular visualisations for use in a report generator. For example, the visualisation could be scheduled weekly to permit comparisons between weeks.

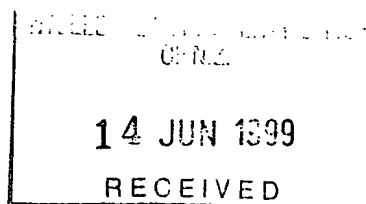
Referring to Figure 23, the user may also enter identifying data for a particular visualisation, for example, a title and any notes useful to the user.


The wizard 70 described above permits a merchant to specify the data to be retrieved from a data warehouse and to specify how this data will be displayed. By using the system described above, the merchant does not require the technical knowledge which has in the past been necessary to formulate appropriate queries.

In summary, the preferred system permits the user to examine a visualisation of interaction data between customers and merchants. This data visualisation and in particular animated visualisations, are a useful complement to other reporting tools, such as the use of charts and graphs.

Using the data visualisation system described above, a user may make sense of and obtain useful data from a data warehouse without requiring technical knowledge. For example, the user may identify optimal times for the sale of particular goods and services and the most desirable positioning of those goods and services. The user may also identify correlations between sales of different goods and services and may also identify the effectiveness of loyalty programmes and other incentive schemes.

The foregoing describes the invention including preferred forms thereof. Alterations and modifications as will be obvious to those skilled in the art are intended to be incorporated within the scope hereof.



**RUSSELL McVEAGH WEST WALKER**  
  
**ATTORNEYS FOR THE APPLICANT**

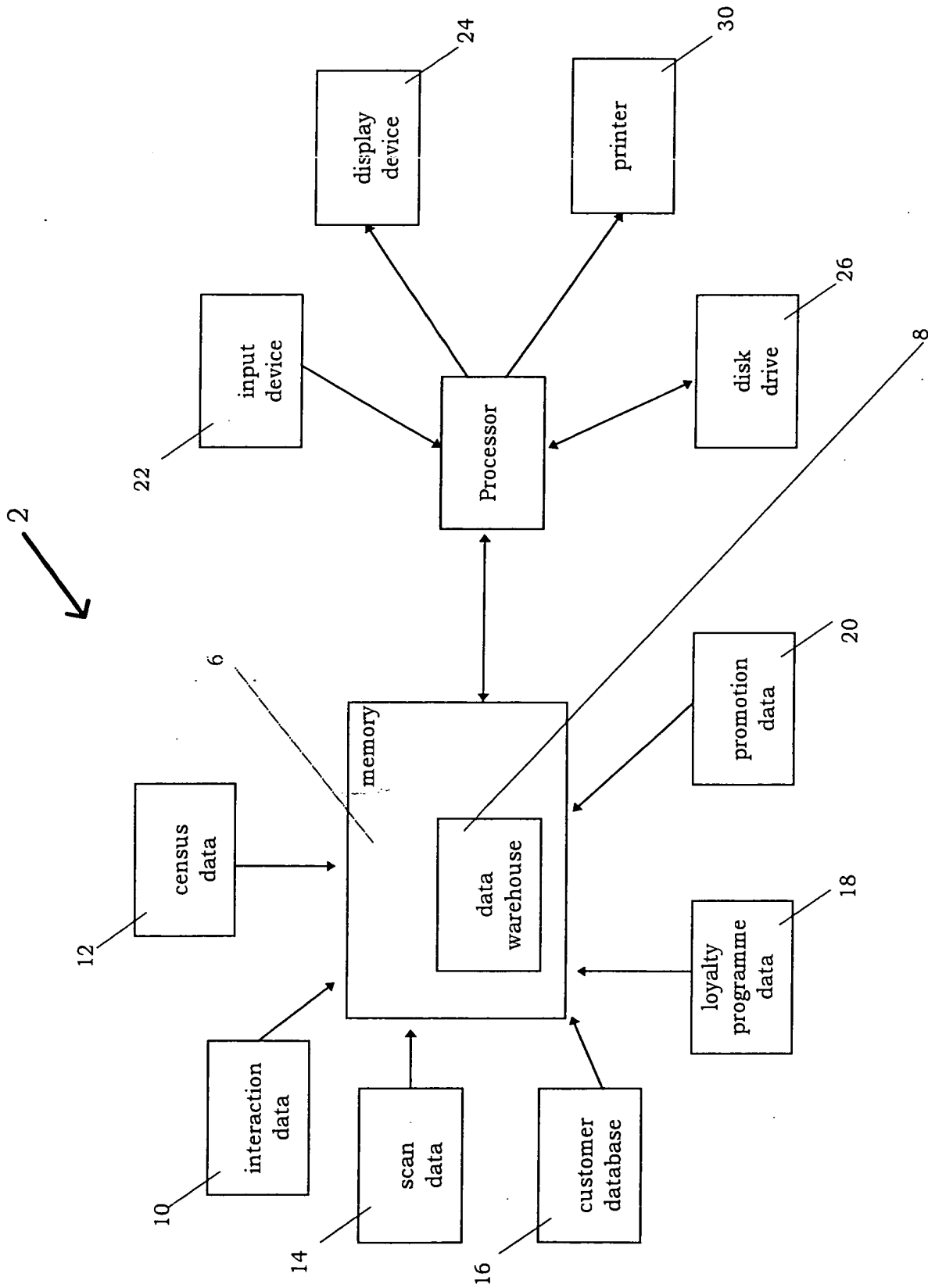


FIGURE 1

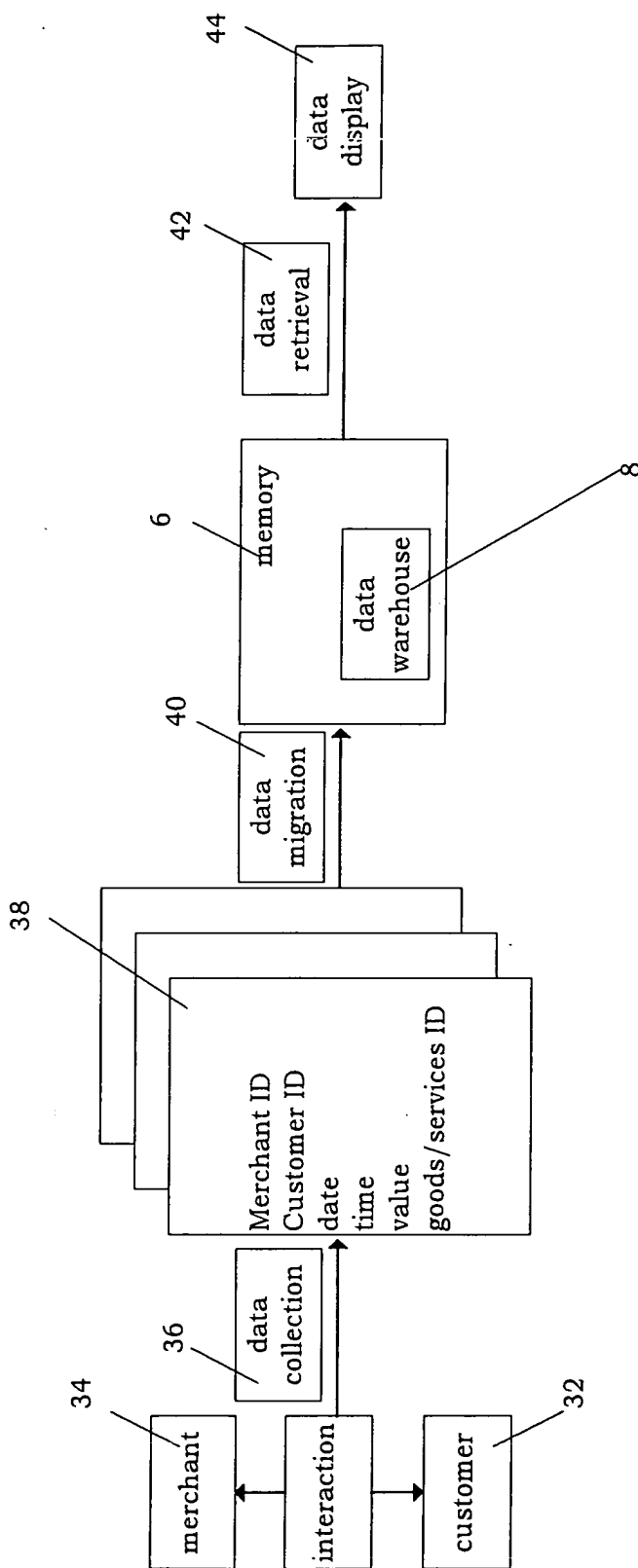


FIGURE 2

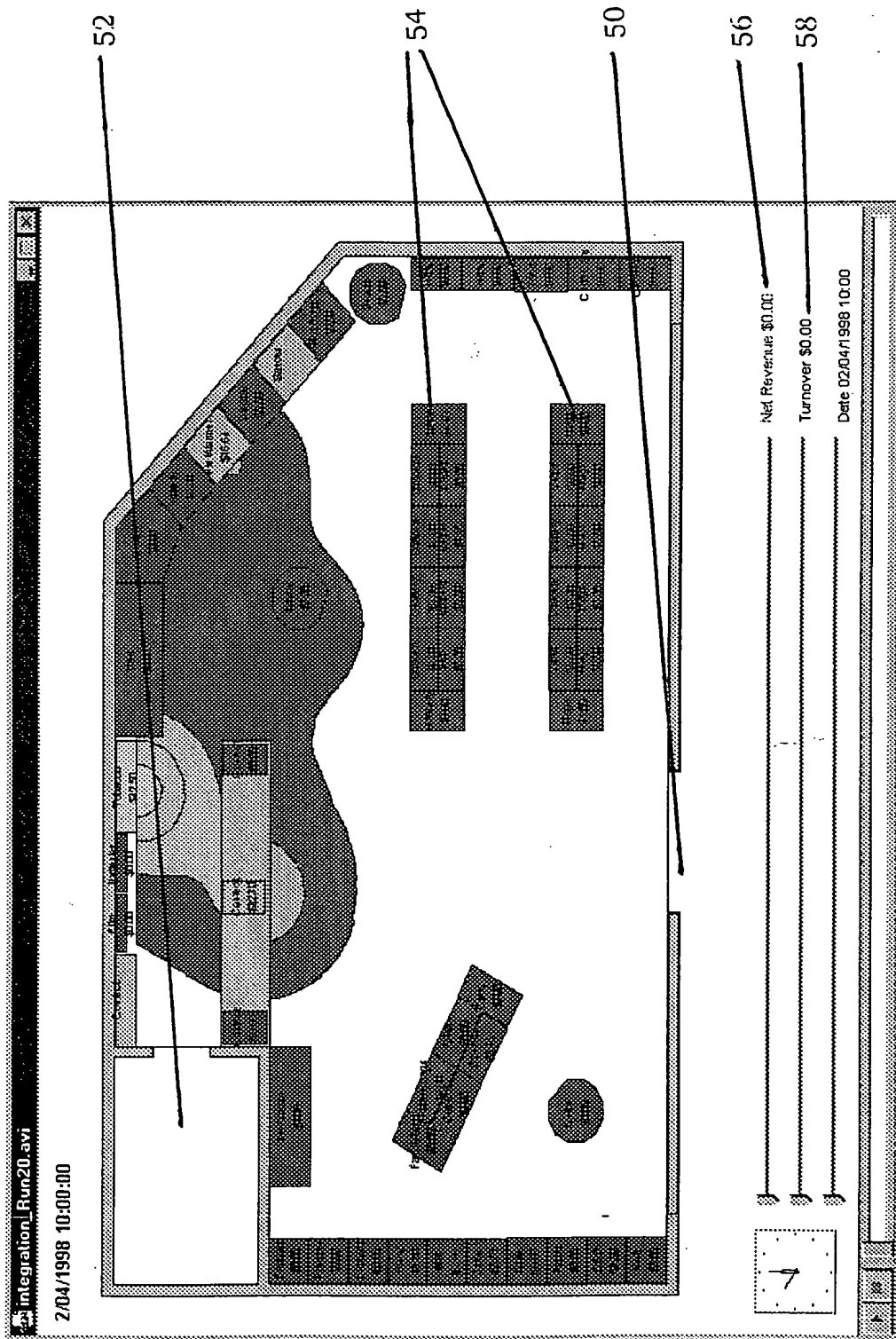


FIGURE 3



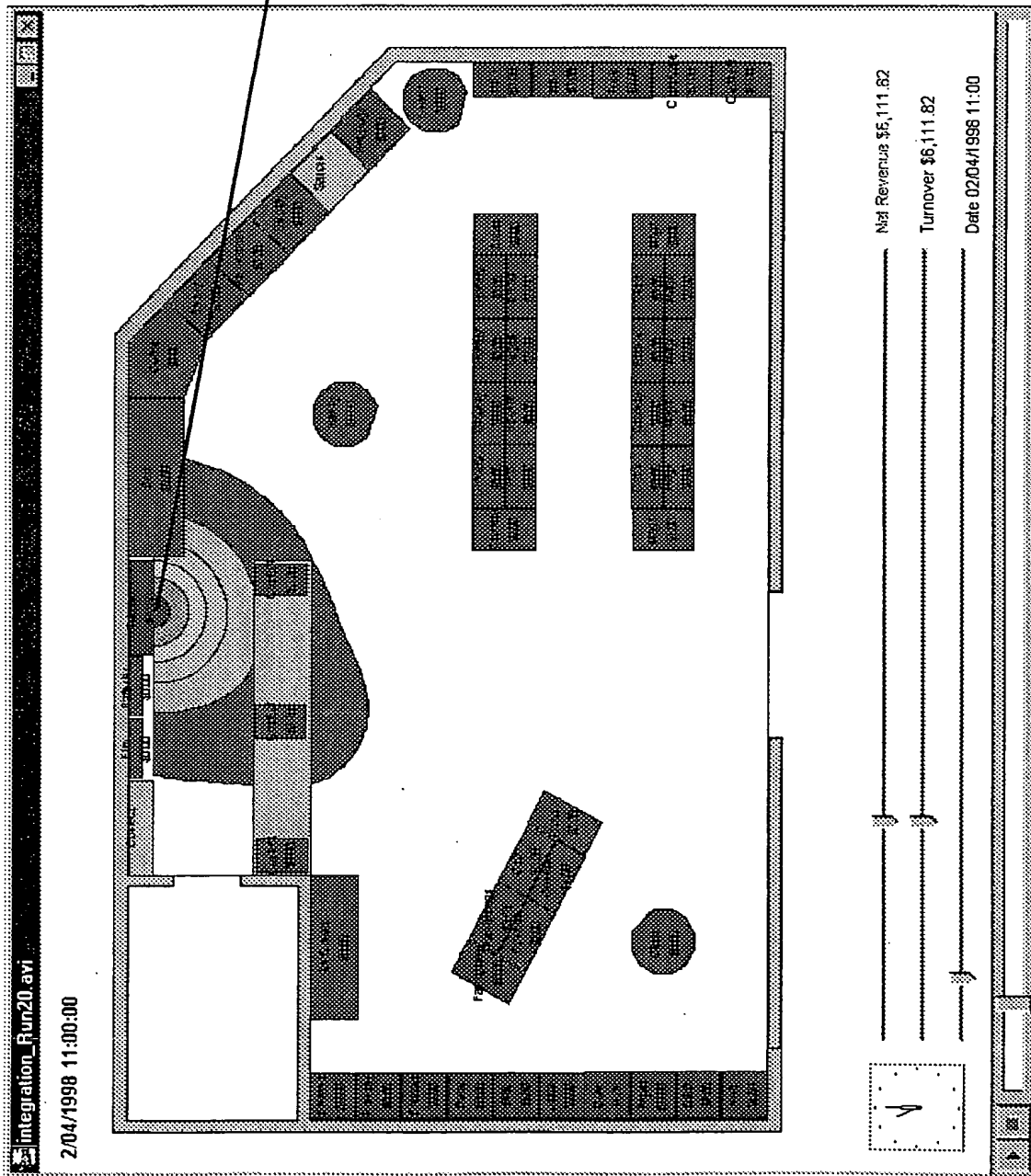


FIGURE 4

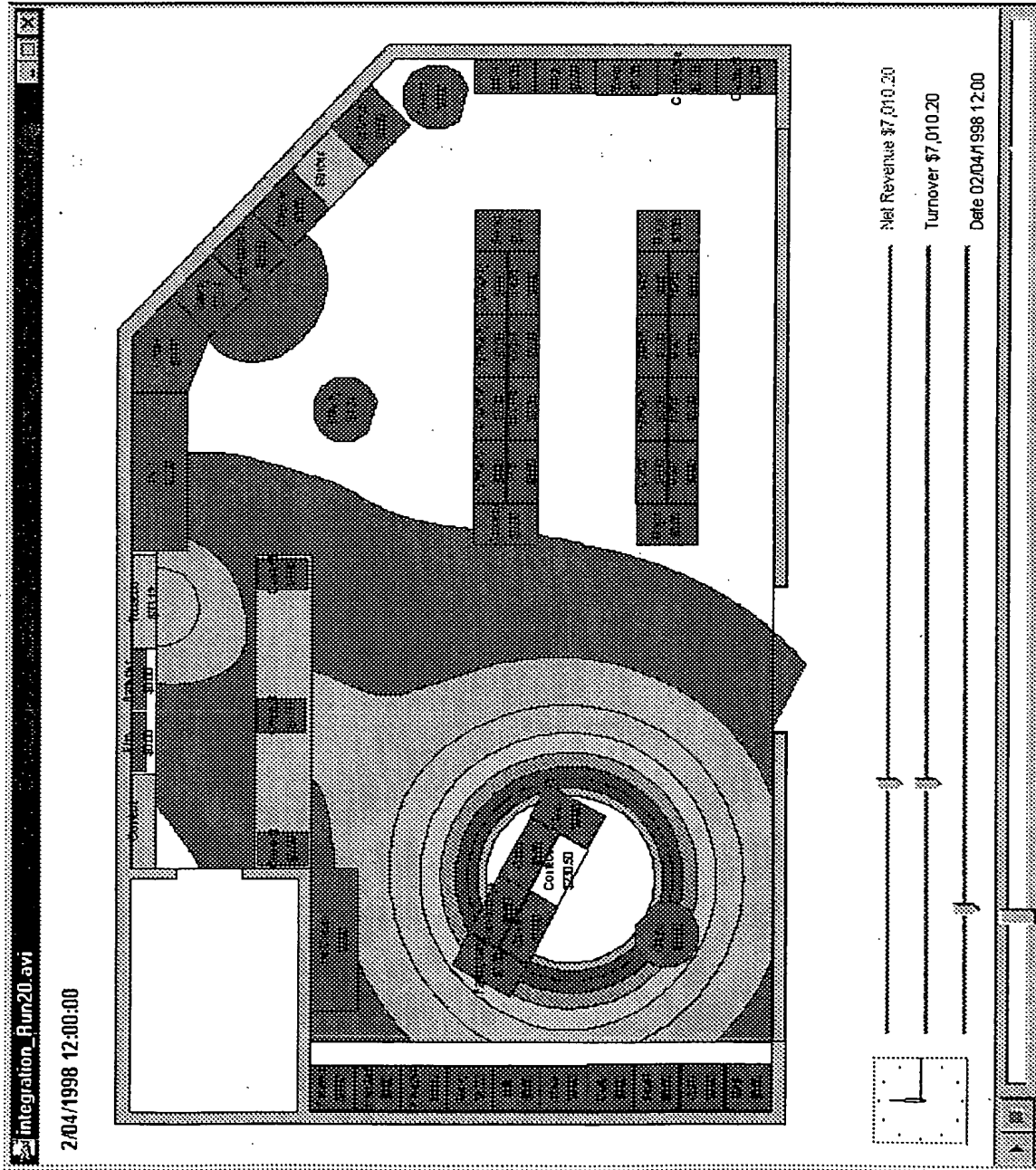


FIGURE 5

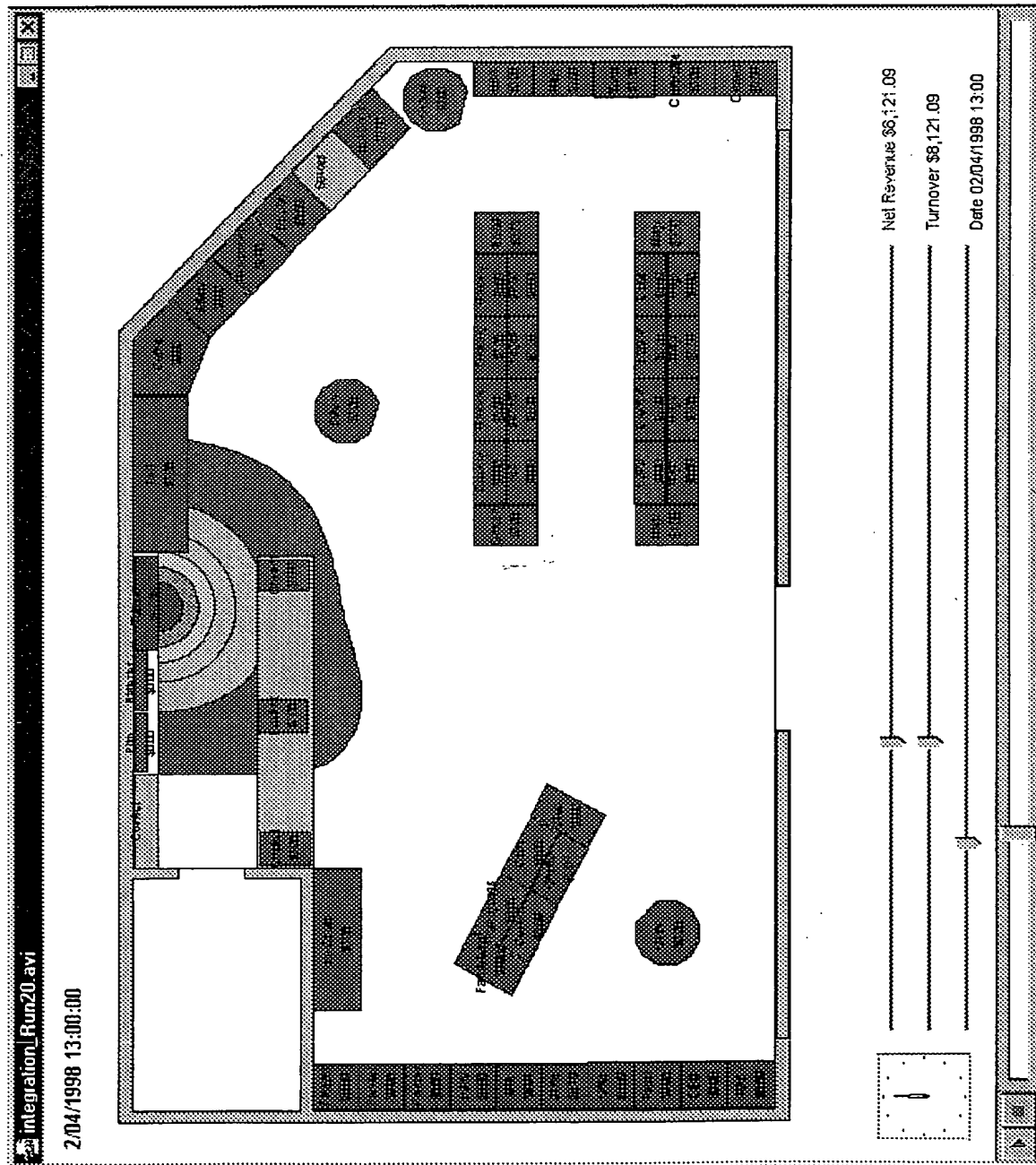


FIGURE 6

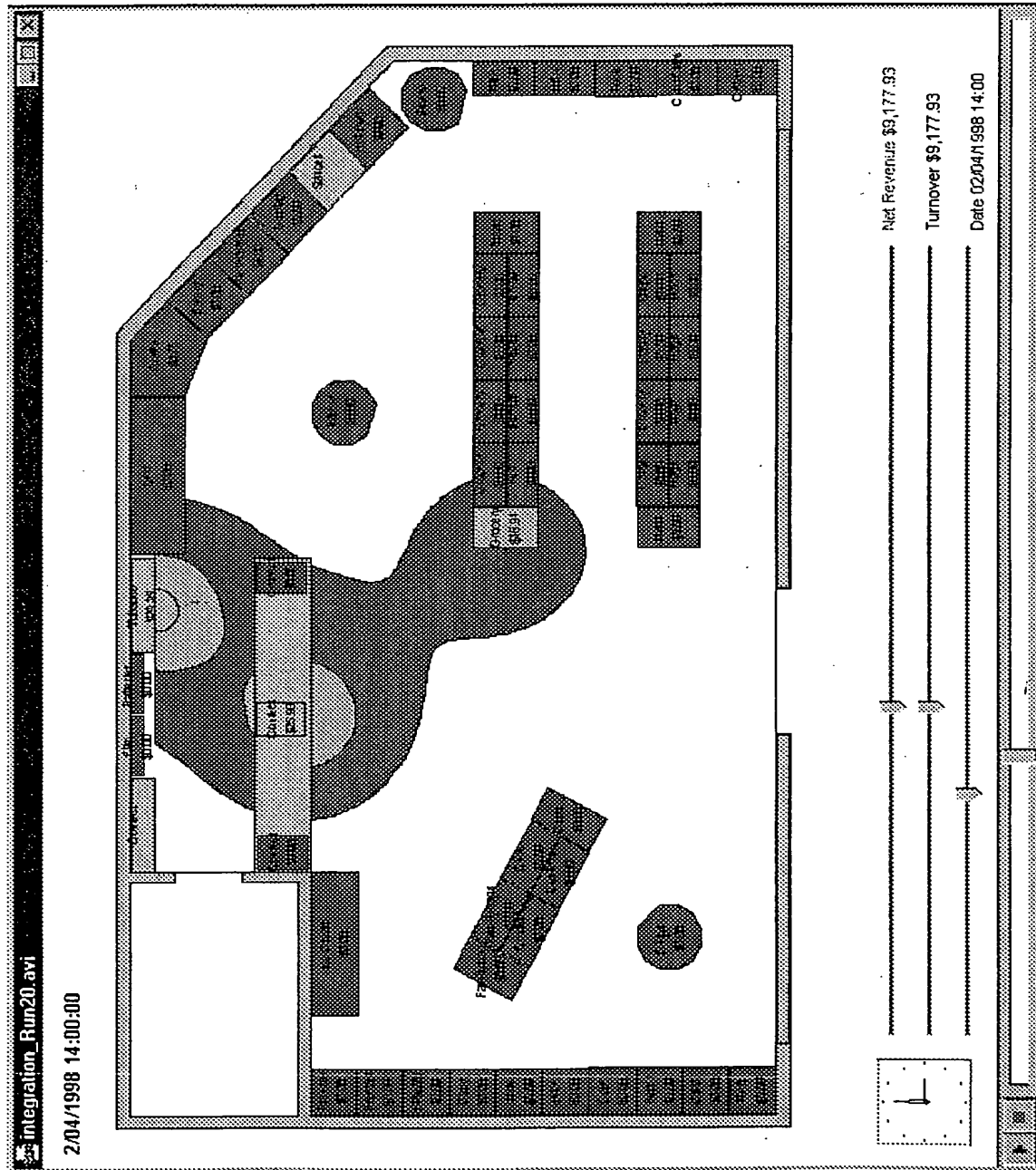


FIGURE 7

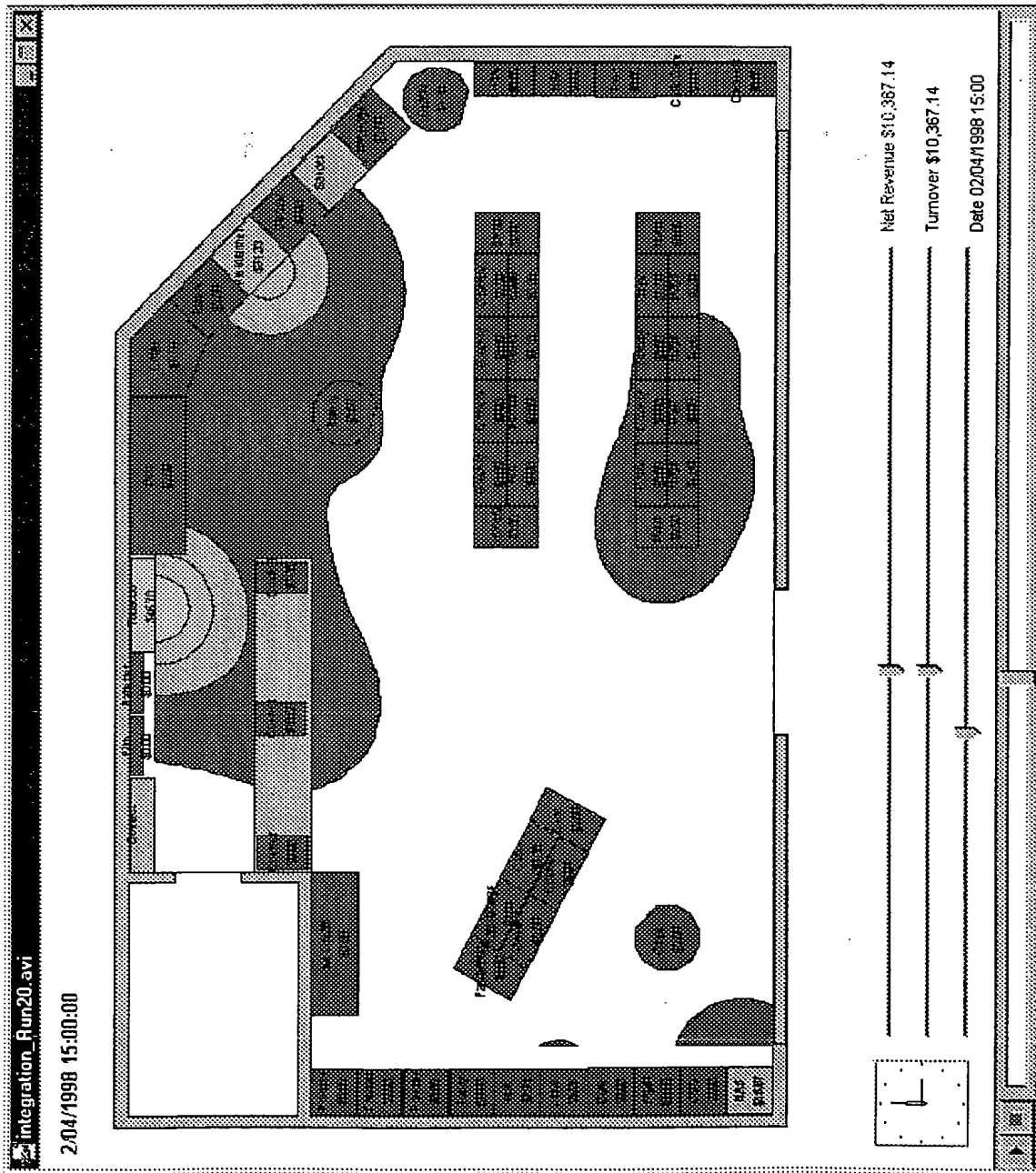


FIGURE 8

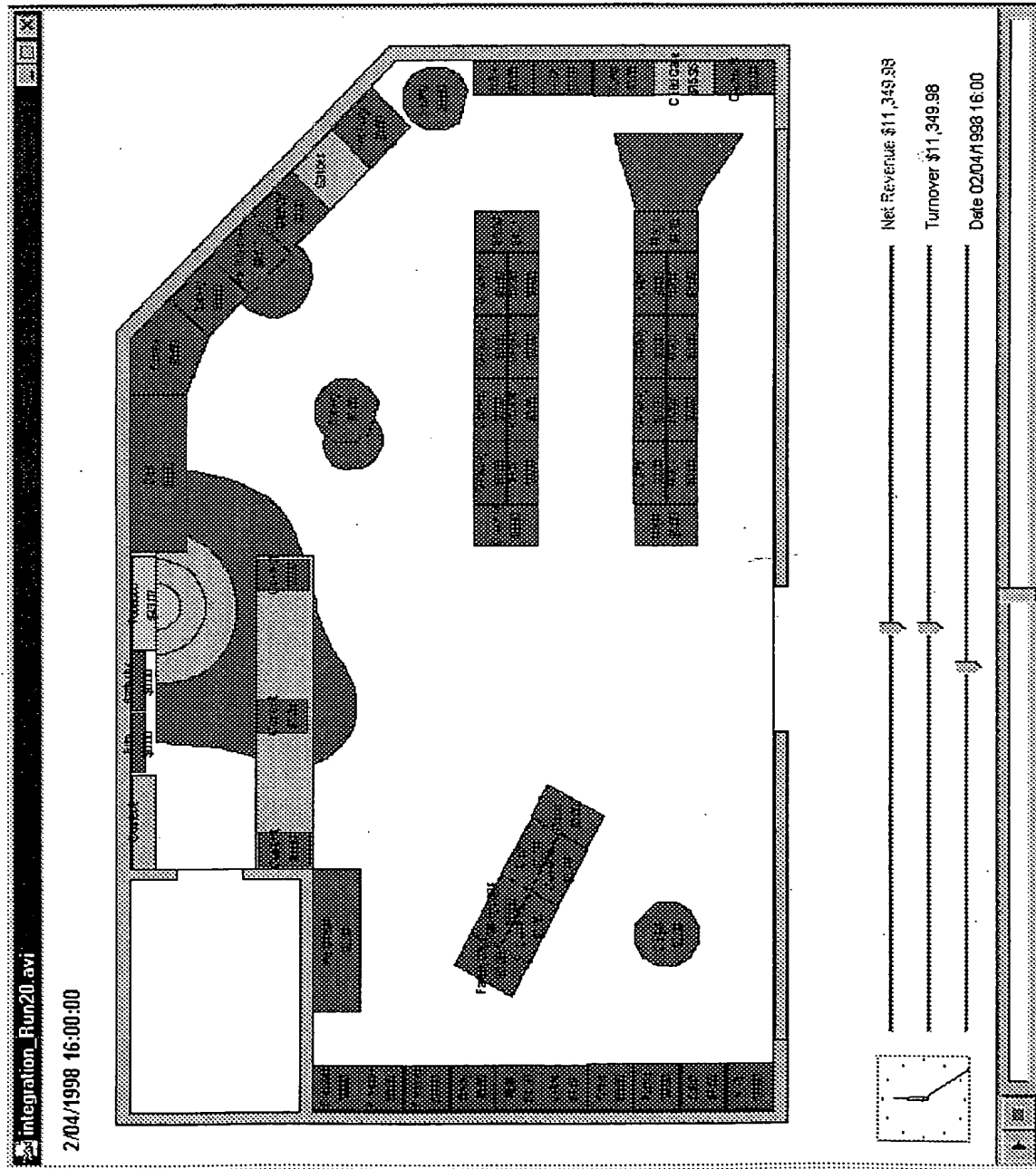


FIGURE 9

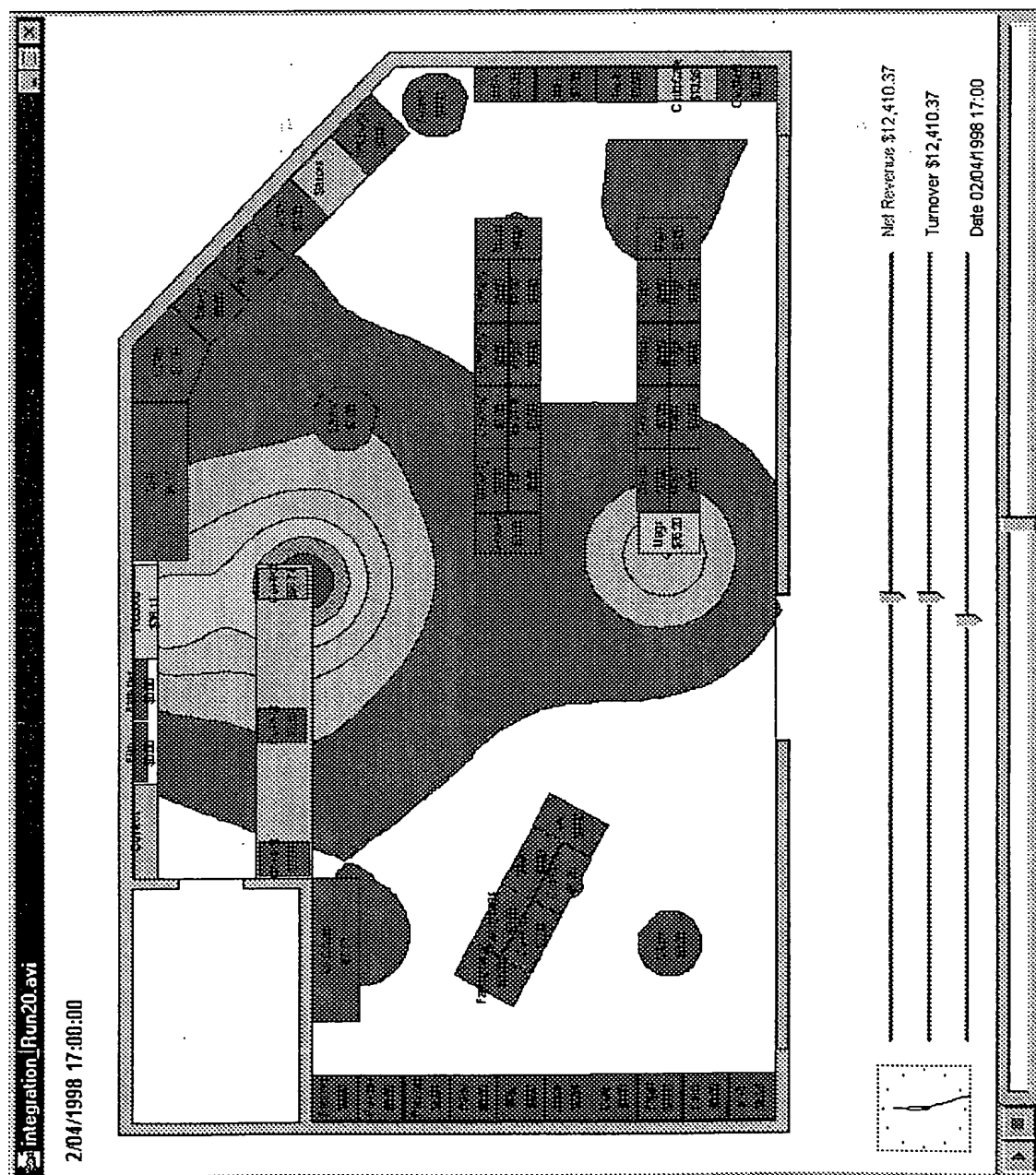


FIGURE 10

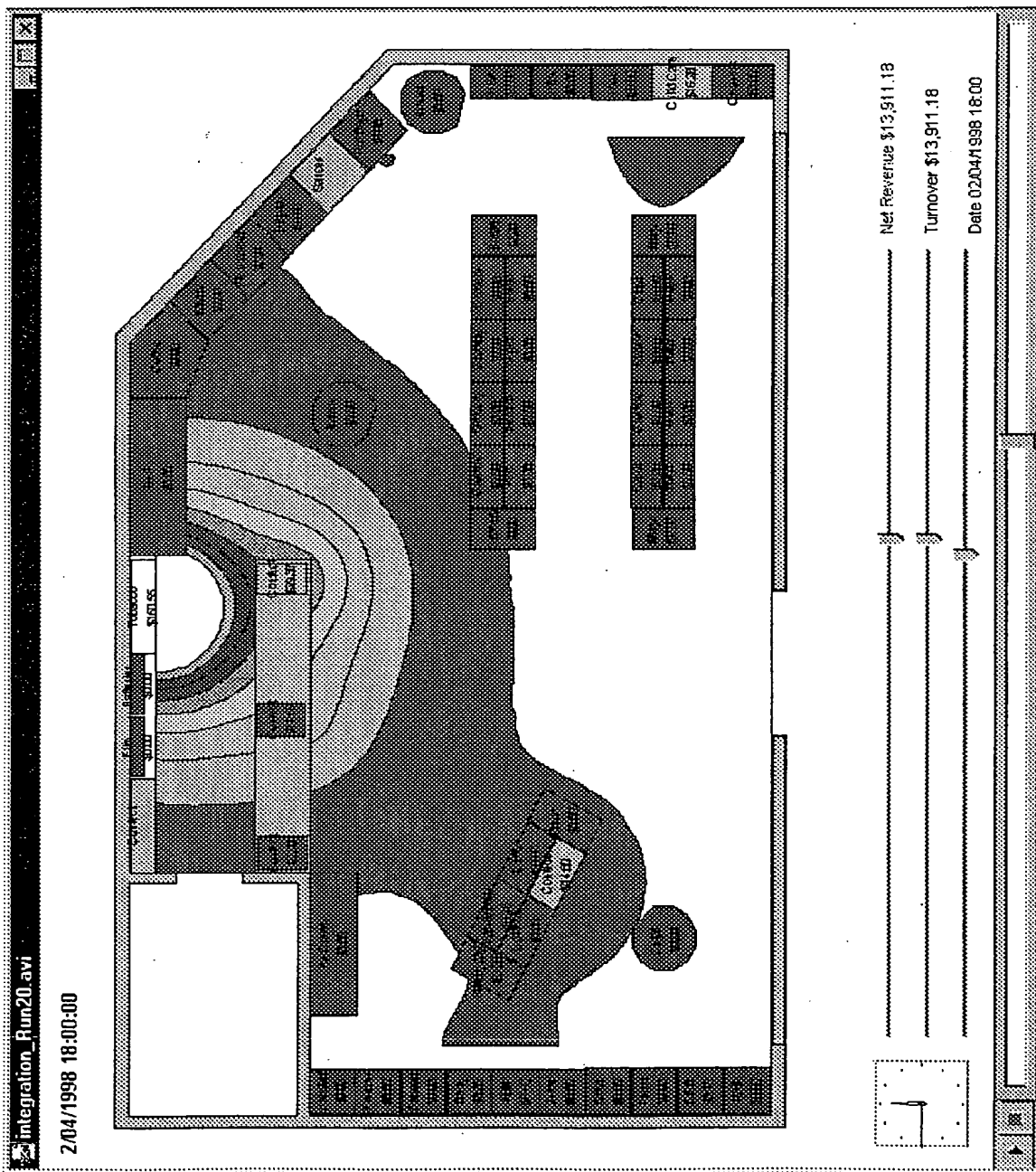


FIGURE 11



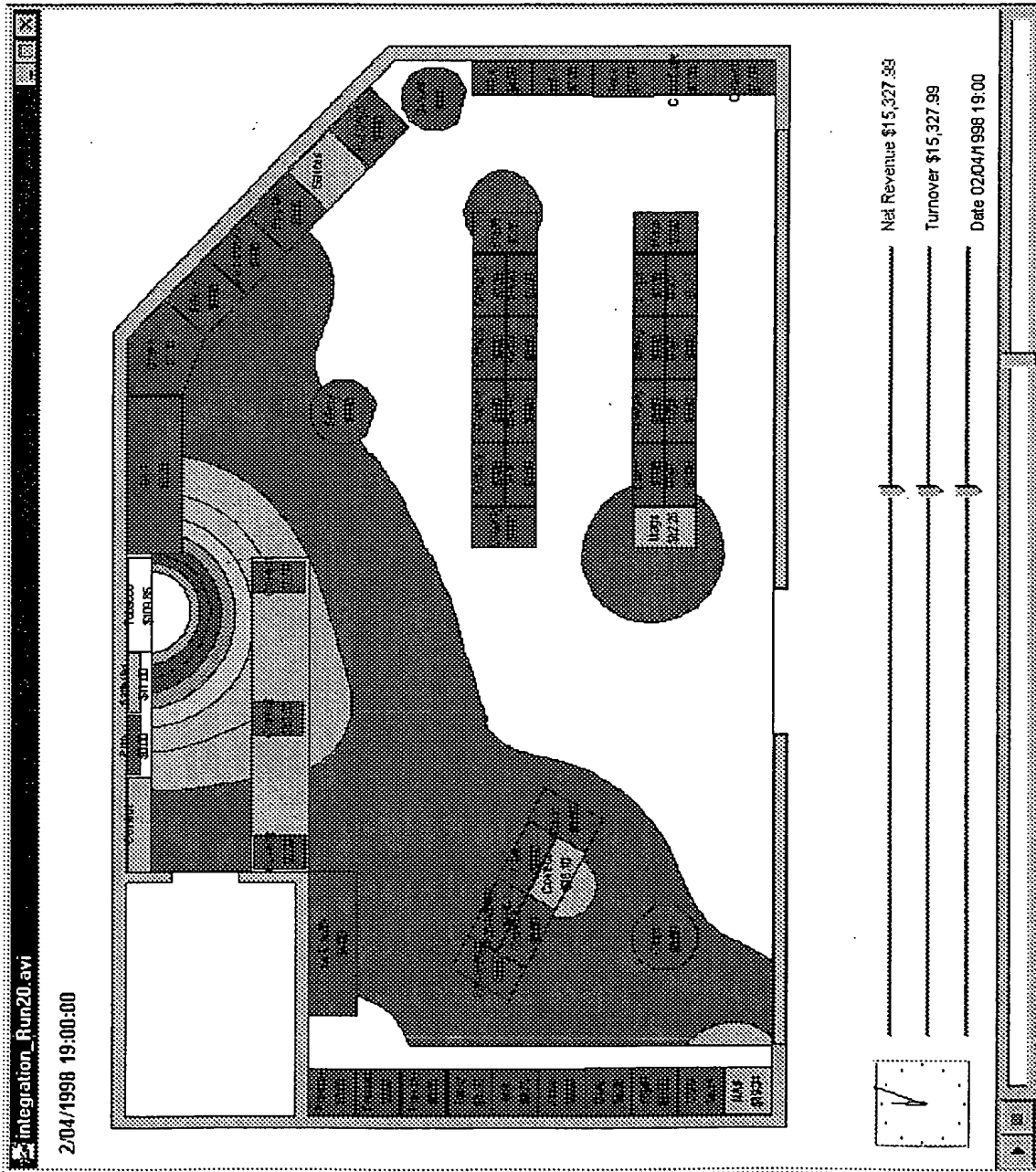


FIGURE 12

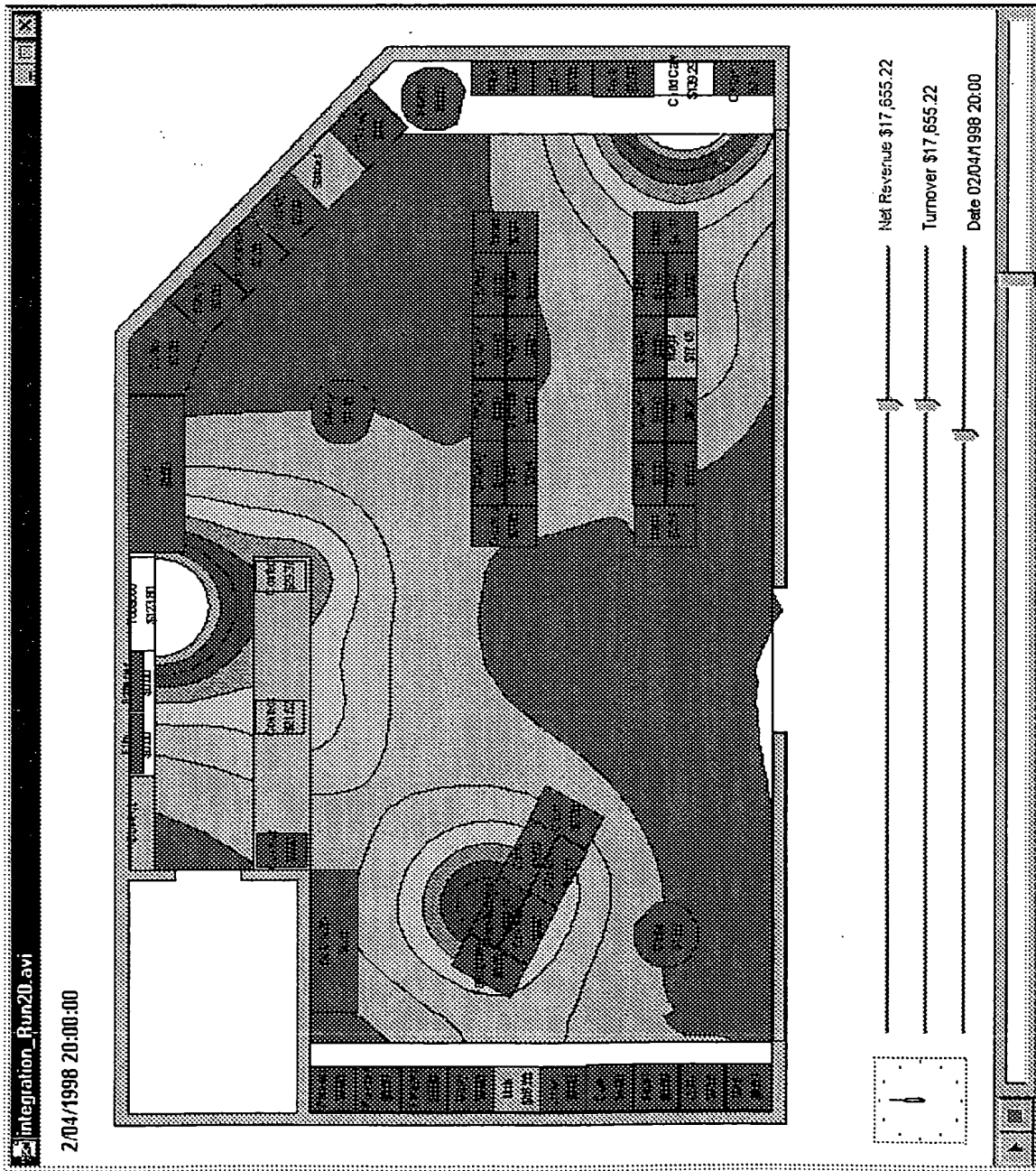


FIGURE 13

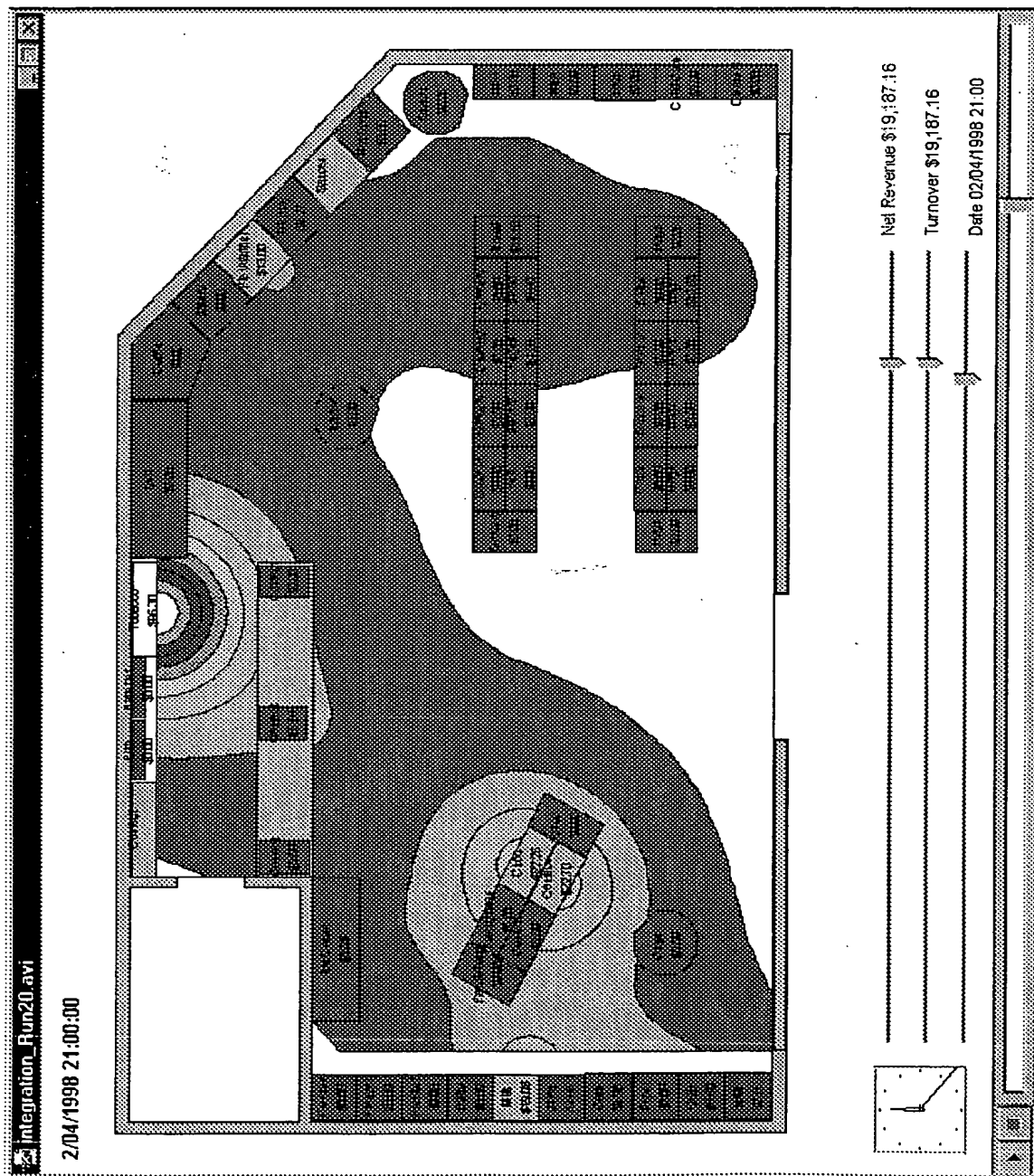


FIGURE 14

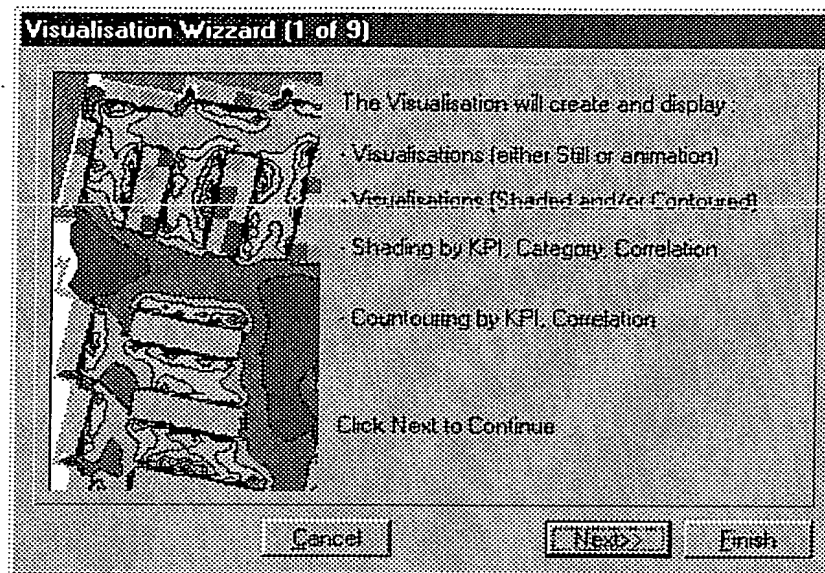


FIGURE 15

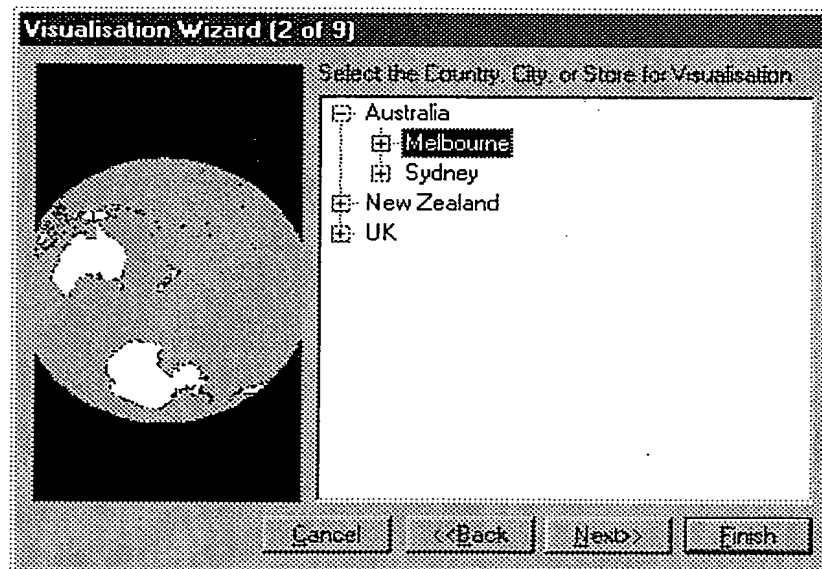


FIGURE 16

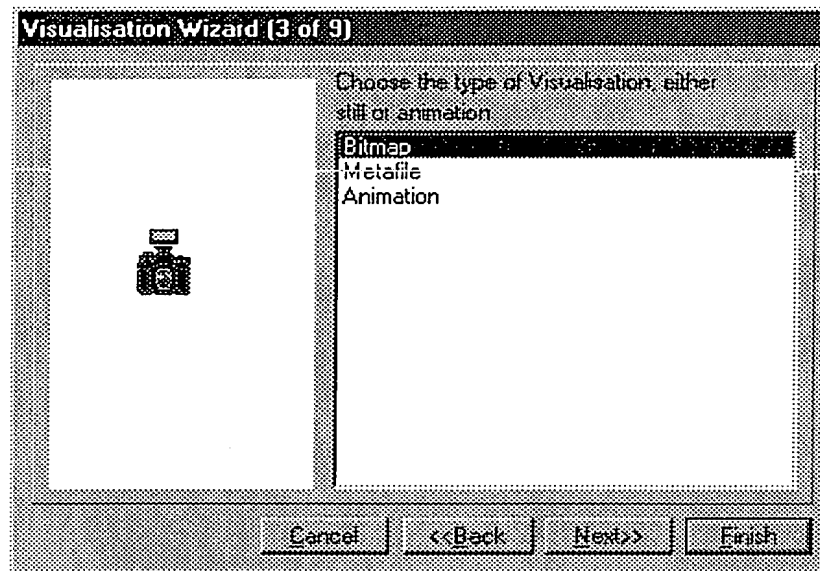


FIGURE 17

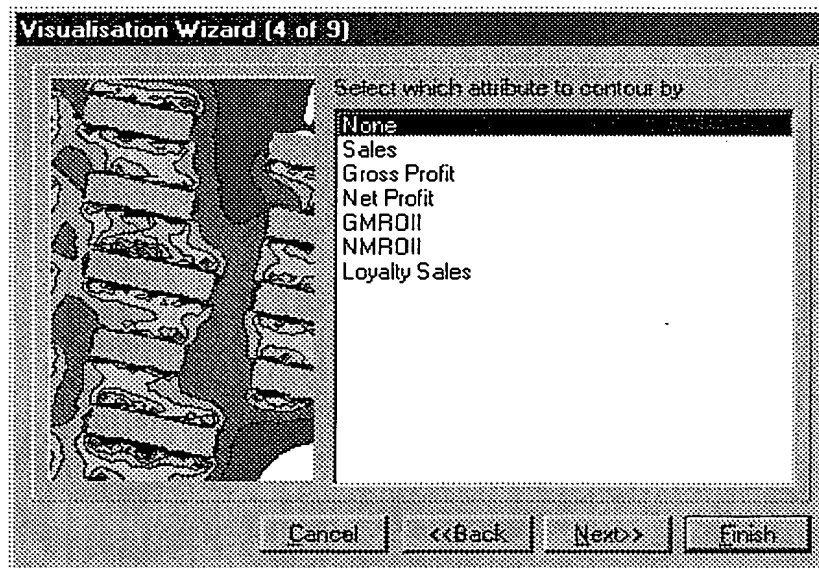


FIGURE 18

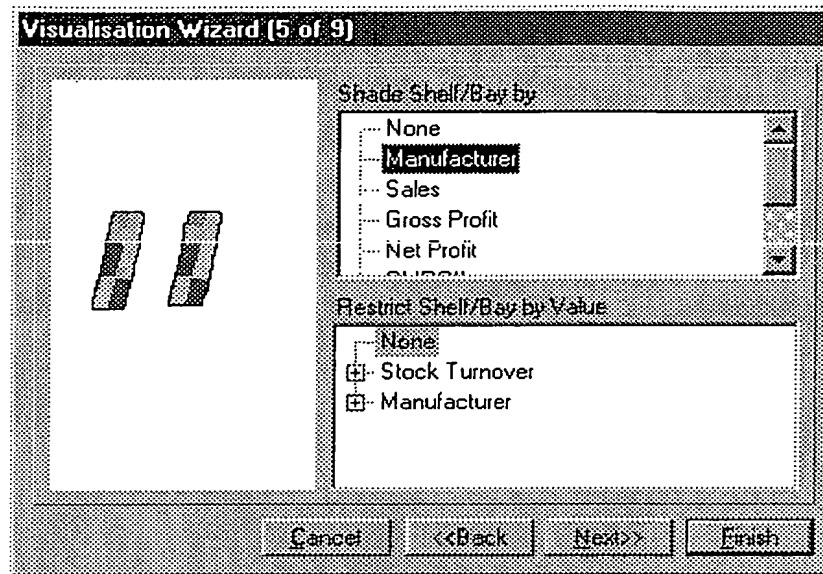


FIGURE 19

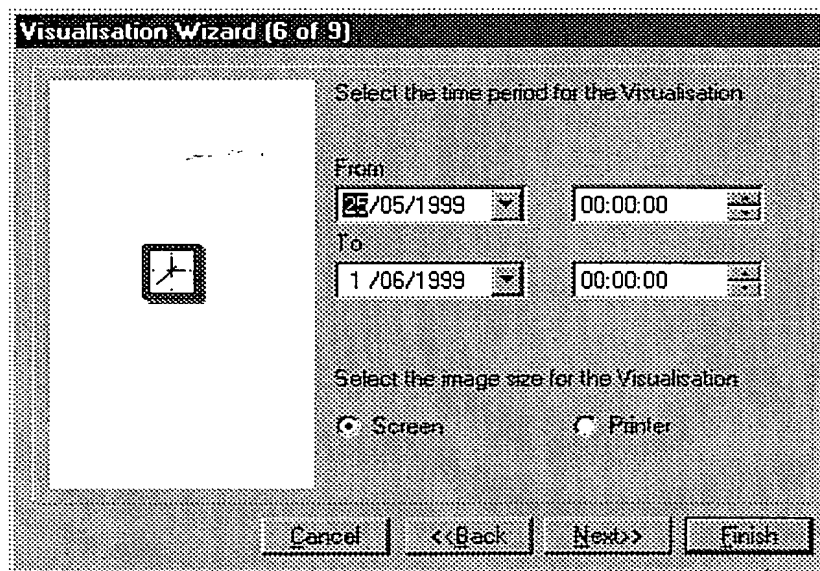


FIGURE 20

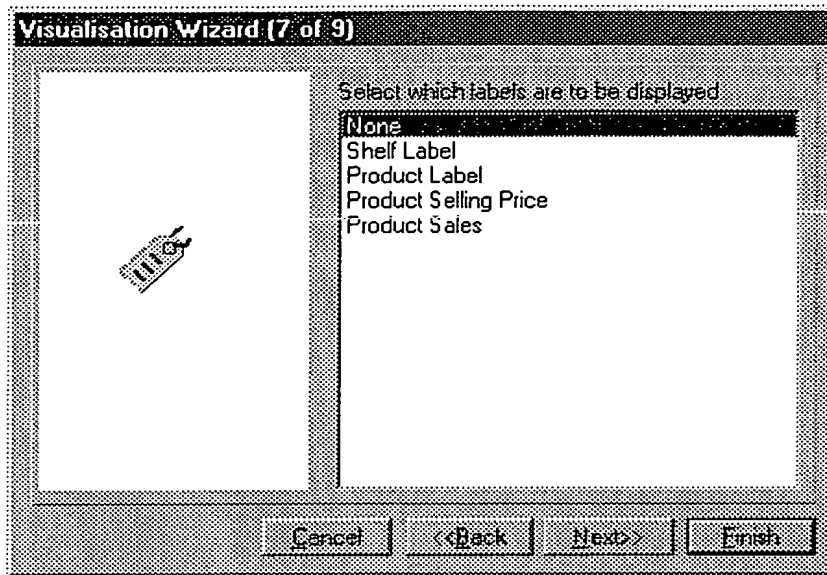


FIGURE 21

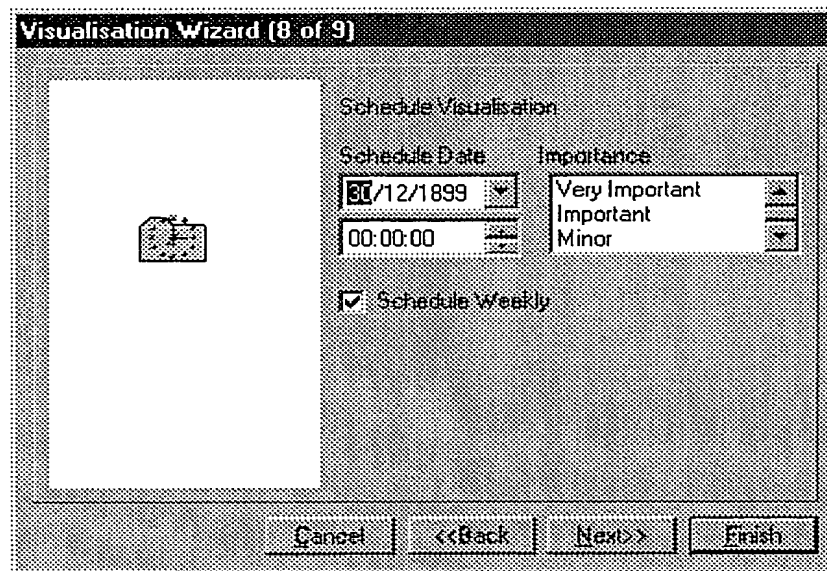


FIGURE 22

**Visualisation Wizard [9 of 9]**

Title

Notes

**XXXXXXXXXXXX**  
**XXX**

X-11

X-12

X-13

X-14

X-15

X-16

X-17

FIGURE 23